No. 894,757. PATENTED JULY 28, 1908.

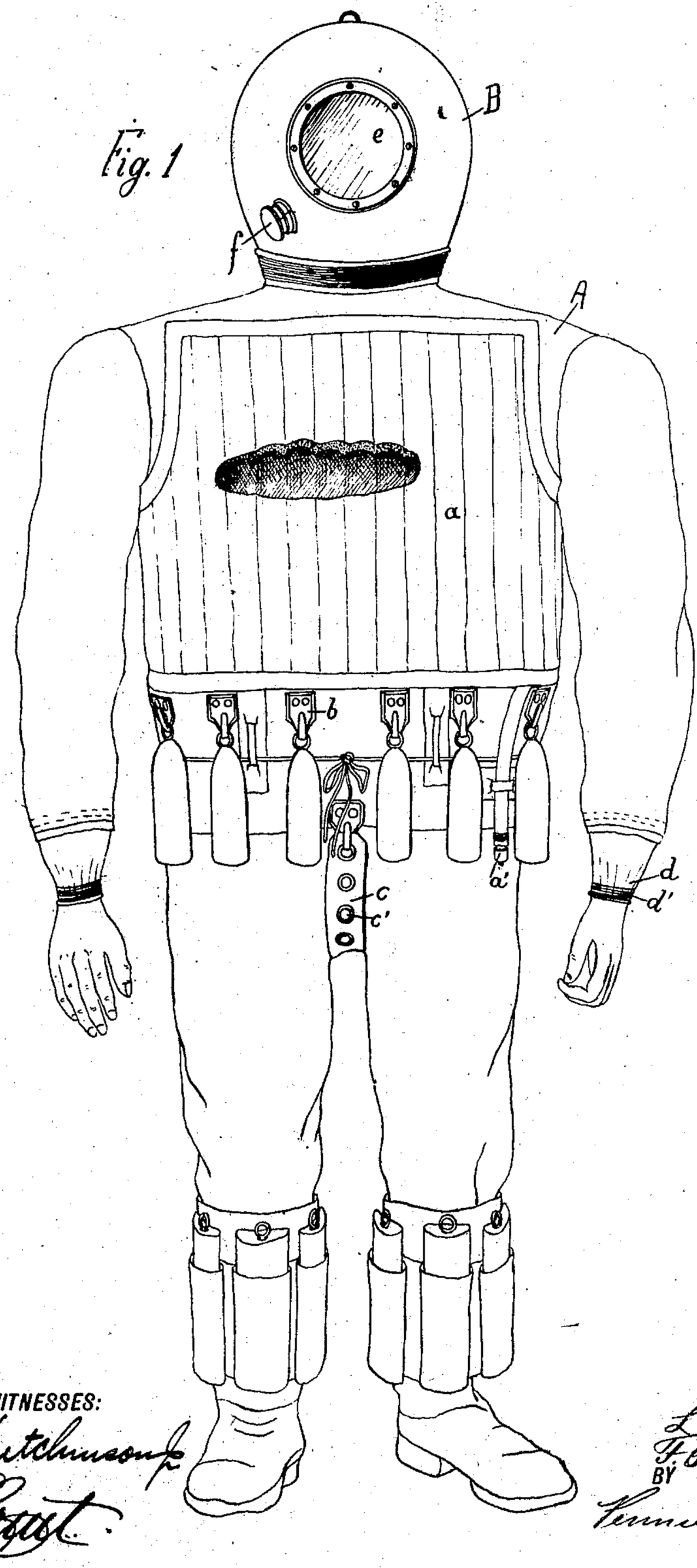
L. Y. SPEAR & F. T. CABLE.

SUBMARINE JACKET.

APPLICATION FILED MAY 9, 1907.

4 SHEETS—SHEET 1.

Fig. 1



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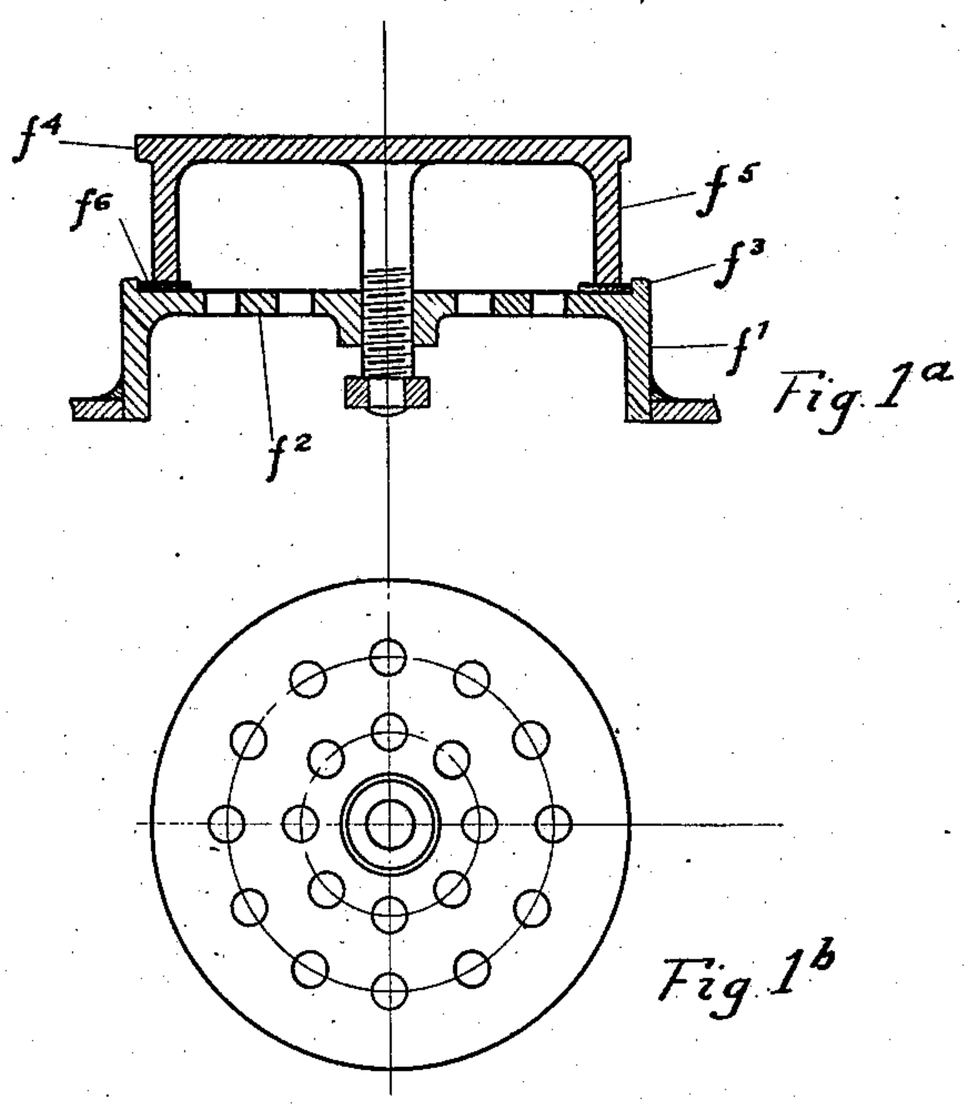

Fig. 1a

Fig. 1b

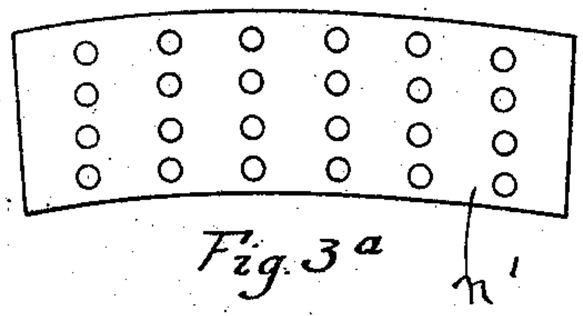

Fig. 3a

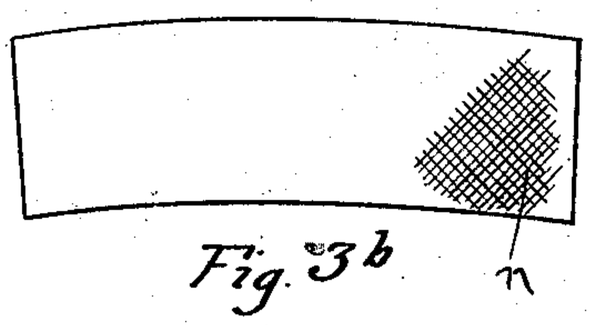

Fig. 3b

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4 SHEETS—SHEET 3.

Fig. 2

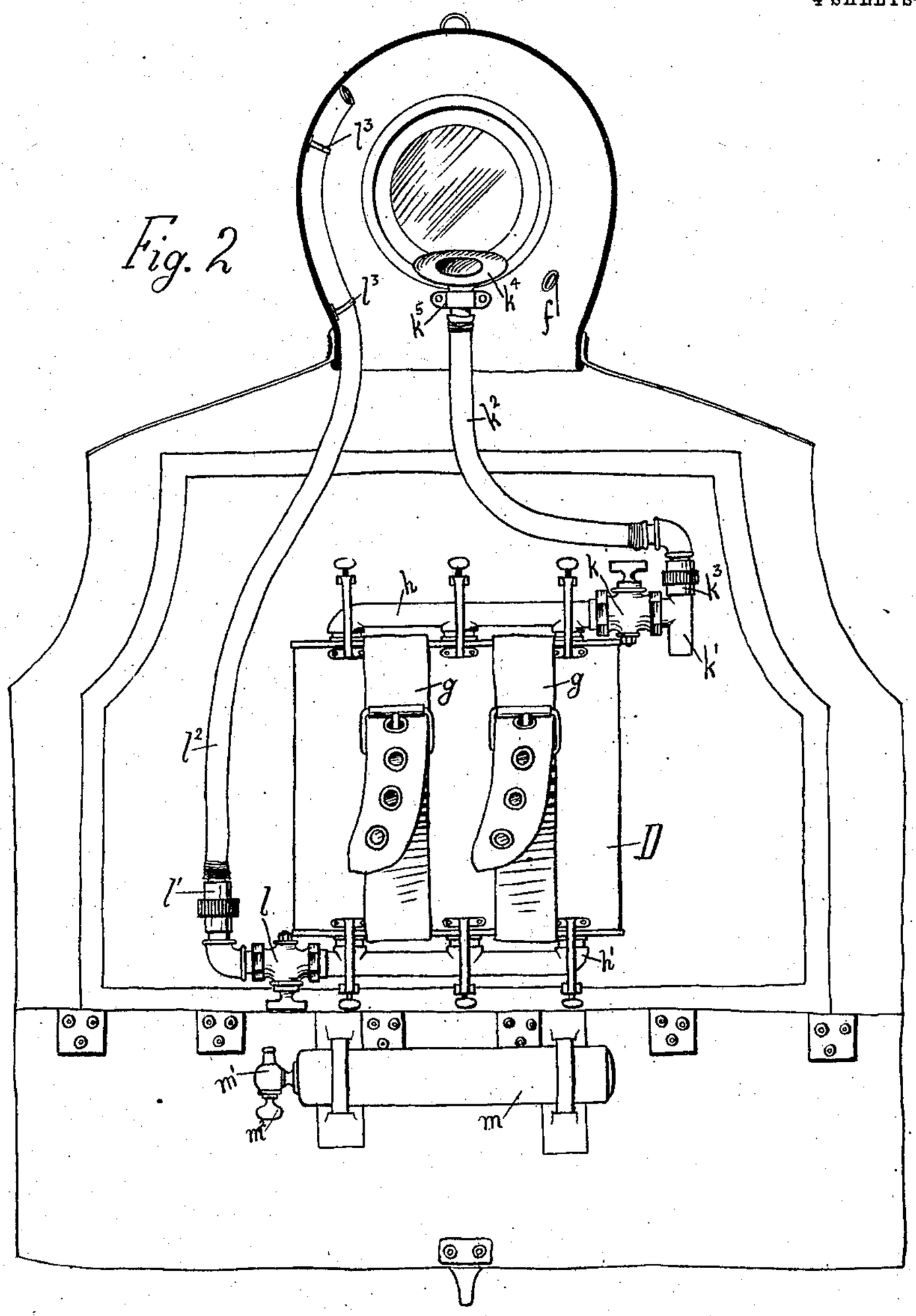
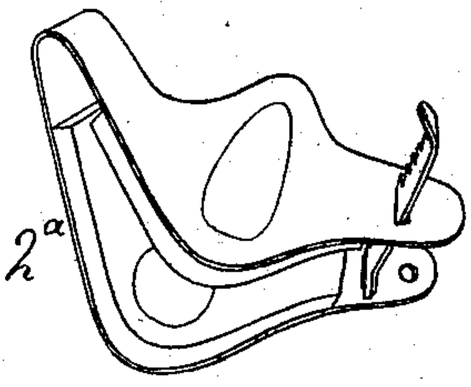


Fig. 2a



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4 SHEETS—SHEET 4.

Fig. 4

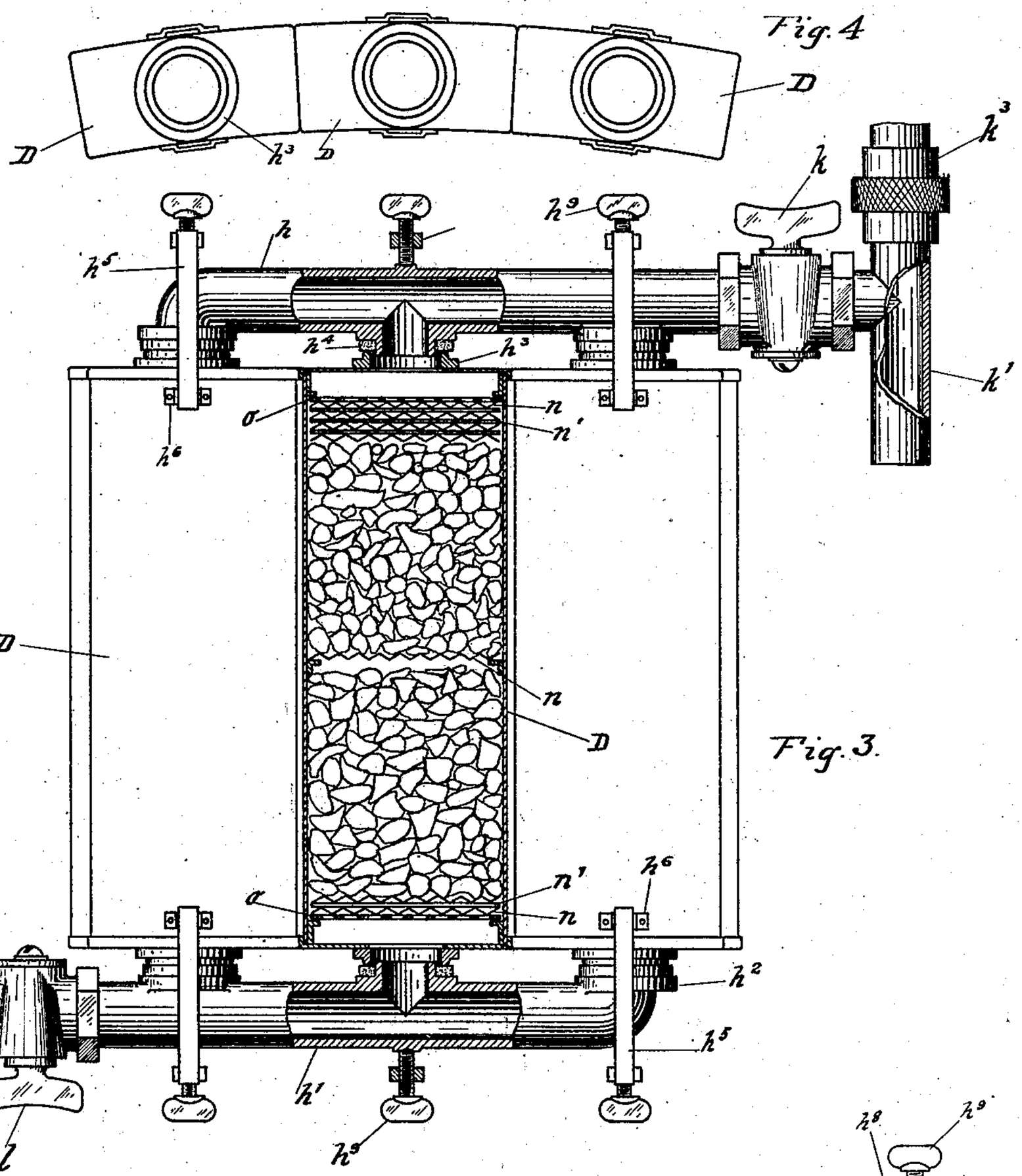

Fig. 3.

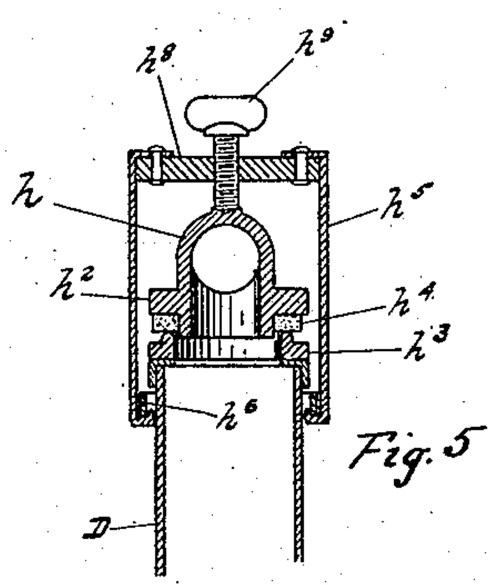

Fig. 5

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UNITED STATES PATENT OFFICE.

LAWRENCE YORK SPEAR AND FRANK TAYLOR CABLE, OF QUINCY, MASSACHUSETTS.

SUBMARINE JACKET.

No. 894,757. Specification of Letters Patent. Patented July 28, 1908.

Application filed May 9, 1907. Serial No. 372,704.

To all whom it may concern:

Be it known that we, LAWRENCE Y. SPEAR and FRANK T. CABLE, citizens of the United States, residing at Quincy, Massachusetts, have invented certain new and useful Improvements in Submarine Jackets; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The submarine jacket may be used for diving purposes or for any contingency where it is desired that a person should remain under water for a length of time, but it is particularly designed as a life-saving device to be used on submarine vessels, and it is intended that each member of the crew of such a vessel shall have his own jacket with which he may escape from the vessel and rise to the surface in an emergency.

The particular nature of the device will be understood from the following description; taken in connection with the accompanying drawings on which like reference characters indicate like parts throughout the several views:

Figure 1 is a sketch of a man wearing the improved jacket. Fig. 2 is a section of the jacket looking at the inside of the front and showing the air purifying chamber and associated parts in elevation. Fig. 3 is an elevation partly in section of the air purifying chamber and the associated parts separated from the jacket. Fig. 4 is a top plan view of the air purifying chamber with the inlet pipe removed. Fig. 5 is a detailed sectional view of one of the seats by which the inlet pipe and the leading off pipe are attached to the air purifying chamber. Figs. 1^a and 1^b are detailed views of a valve mounted in the face of the helmet by which communication may be established with the outside air. Figs. 3^a and 3^b are plan views of the sheets forming part of the strainer, and Fig. 2^a is a perspective of a nose clip.

The jacket comprises a body portion A and a non-collapsible helmet B. The body portion may be made of canvas or any other suitable material used in the manufacture of diving suits, and it has on the front and the back, air chambers *a* provided with inlet pipes *a'* by which they may be inflated. The jacket also carries a series of hooks *b* to which weights are hung in the ordinary manner, and it has a strap *c* which passes between the legs of the wearer and by means of the several holes *c'* takes over an appropriate hook on the front of the jacket in order to hold the jacket in place. The arms end in rubber wristlets *d* which fit tightly about the wrists of the wearer, and in use these wristlets are commonly further sealed against the admission of air to the interior of the jacket by binding cords tightly about them as indicated at *d'*. The helmet is sufficiently strong to withstand the maximum pressure to which it may be subjected under water and is secured air tight to the neck of the jacket in any appropriate manner, as by a tight binding of cord as indicated on Figs. 1 and 2. In the face of the helmet there is a glass plate *e* for the ordinary purposes of observation, and at one side of this plate is a valve *f* shown in detail in Figs. 1^a and 1^b. This valve comprises a cylindrical casing f' welded to the side of the helmet and having the perforated top plate f^2 and the upturned rim f^3. At the center the plate f^2 has a downwardly projected screw threaded boss into which is screwed the stem of the cap f^4. The rim f^5 of the cap engages a gasket f^6, on the upper face of the plate f^2. When the cap f^4 is screwed down into place the valve is tightly sealed and when the cap is screwed up, air enters between the rims f^3 and f^5, and passes through the perforations f^2 into the inside of the helmet.

On the inside of the front portion of the jacket is secured by appropriate straps *g*, the air purifying chamber D, comprising three separate tanks held together on a curved line to fit the chest of the wearer as indicated in Fig. 4 by the inlet and outlet pipes *h* and *h'*. Each of these pipes has three sockets h^2, adapted to rest upon seats h^3 on the opposite ends of the three tanks. The manner in which these parts are held in place and leakage is prevented is indicated by the section Fig. 5, from which it will be seen that the socket h^2 rests upon a seat h^3, the gasket h^4 being interposed between the two. On the opposite sides of each tank are small brackets h^6, adapted to grasp the hooked ends of the straps h^5, secured to the cross piece h^8. This cross piece is provided at its center with a thumb screw h^9, the end of which engages a depression on the upper face of the pipe and,

as will be readily understood, the screwing in of the thumb screws tightly clamps the pipes in place and by means of gaskets h^4, leakage is prevented.

Each tank is intended to be filled with a material capable of absorbing carbon dioxid and preferably water also, and liberating oxygen for purifying and revivifying the air. The material which I prefer to use is that which is known as oxylithe P. S. and is a compound containing sodium and potassium peroxid and made up of two parts of potassium peroxid to one part of sodium peroxid, to which is added 2% of anhydrous sulfate of copper. This material is in powdered form and is separated from the inlet by a series of sheets which are alternately a sheet of wire gauze n and a sheet of perforated asbestos n', held in place by the plate o spaced from the inlet as indicated at Figs. 3^a and 3^b. About the center of each tank in the body of the oxylithe is placed a sheet of wire gauze n, and at the lower end of the tank and adjacent to the outlet is another series of alternate gauze and asbestos sheets n and n'. At the free end of the inlet pipe h, is a stop cock k of any appropriate construction, and beyond the stop cock the inlet pipe runs into a trap k', in which any saliva breathed into the instrument may accumulate. A flexible pipe k^2 is secured to the upper open end of this trap k' by a union k^3, by which the parts may be readily disengaged. The pipe k^2 is sufficiently stiff to prevent collapsing under pressure and is continued up in the front part of the helmet into a position in front of the mouth of the wearer, where it is provided with a mouth piece k^4. It is intended that the wearer should place this mouth piece inside his mouth and bite his teeth over the body of it so that he breathes directly into the tube k^2. The mouth piece is secured in the proper position by the bracket k^5. The outlet pipe h' is provided with a similar stop cock l and union l', and by means of this union is connected to a flexible pipe l^2, which is also non-collapsible and is continued up well into the upper part of the helmet and secured in place by brackets l^3. This pipe has a free open end opening into the interior of the helmet.

Below the air purifying tank when it is attached, we prefer to mount a compressed air reservoir m having a needle valve m' which may be opened and closed by turning the stem m^2 in a well known manner. The purpose of this compressed air will be further described.

In operation, the user puts on the jacket and secures the bands d' around his wrists to render the jacket air tight at that point and likewise fastens the bands c and attaches the necessary weights and inflates the air bags. During this part of the operation, the valve f may remain open in order that the user may breath the outside air. When he is prepared to enter the water he opens the cocks k and l, which up to this time have remained closed thereby excluding the air from the purifying chamber, takes the mouth-piece in his mouth, attaches a nose clip such as shown in Fig. 2^a to his nose, and enters the water. The water rising under the lower edge of the jacket compresses air within the jacket and the helmet and forms a water seal above the lower edge of the jacket. If the user has entered the water from a submarine boat, the air in the jacket will be at the same pressure as the air in the boat and will usually sufficiently exclude the water. If, however, for any reason it is necessary to further exclude the water, as when he moves into a place of high water pressure from a place of low air pressure, he may by turning the needle valve m' admit air into the jacket from the tank m, thereby further excluding the water to the desired degree. Thereupon, when the user breathes into the mouth-piece, the carbon dioxid and the moisture of his breath pass into the purifying chambers where the carbon dioxid is absorbed by the material and preferably also the water, and oxygen is given off which is inhaled by the user. When the oxylithe P. S. above described is used the reaction may be expressed as follows:

$$K_2O_4 + Na_2O_2 + 2CO_2 = K_2CO_3 + NaCO_3 + 2O_2$$

The potassium carbonate thus produced is extremely deliquescent and the sodium carbonate is slightly so and the moisture of the breath will be rapidly absorbed by these materials. It will be observed that under these conditions all the oxygen which has been combined with the carbon to produce the carbon dioxid is liberated and the air is thus kept at its original purity.

It will be understood that, though we prefer to use the particular material herein mentioned as the purifying agent, there are other materials which may be used for the purpose, such for example as potassium,—sodium dioxid, $NaKO_3$.

The weights hung from the hooks b may be detached to allow the user to rise to the surface, or the jacket may be otherwise manipulated in the ordinary manner of driving suits.

During the breathing operation the other ends of the purifying tanks are connected with the air within the helmet by the pipe l^2 so that the air pressure is equalized throughout the system and in the lungs of the user whereby there is no tendency for the pressure upon the air to too greatly expand his lungs.

What we claim is:

1. A watertight submarine jacket comprising a body portion, a non-collapsible helmet secured thereto by watertight connection and of sufficient capacity to form an air chamber about the head of the wearer, means

for preventing the escape of air through the arms when the jacket is sealed at the bottom by rising water, and means for revivifying the air within the jacket, substantially as described.

2. A watertight submarine jacket comprising a body portion, a non-collapsible helmet secured thereto by a watertight connection, an air purifying chamber containing material capable of absorbing carbon dioxid and liberating oxygen, a mouth piece in the helmet communicating with the purifying chamber and an outlet from the purifying chamber in communication with the interior of the jacket, substantially as described.

3. A watertight submarine jacket comprising a body portion, a non-collapsible helmet secured thereto by watertight connection and of sufficient capacity to form an air chamber about the head of the wearer, means for preventing the escape of air through the arms when the jacket is sealed at the bottom by rising water, a tank of air under high pressure within the jacket and provided with a stop valve whereby air may be admitted inside the jacket to expel water at its bottom, and means for revivifying the air within the jacket, substantially as described.

4. A watertight submarine jacket comprising a body portion, a non-collapsible helmet secured thereto by a watertight connection, an air purifying chamber within the jacket and containing material capable of absorbing carbon dioxid and liberating oxygen, a mouth piece within the helmet communicating with said chamber and an outlet from the chamber communicating with the interior of the jacket, substantially as described.

5. A watertight submarine jacket comprising a body portion, a non-collapsible helmet secured thereto by a watertight connection and of sufficient capacity to form an air chamber about the head of the wearer, an air purifying chamber containing material capable of absorbing carbon dioxid and liberating oxygen, a mouth piece within the helmet and communicating with the said chamber through a pipe containing a drip trap, and an outlet from the chamber communicating with the interior of the jacket, substantially as described.

6. A watertight submarine jacket comprising a body portion, a non-collapsible helmet secured thereto by a watertight connection and of sufficient capacity to form an air chamber about the head of the wearer, an air purifying chamber within the jacket and made up of a number of sections, a mouth piece within the helmet and pipe leading from the mouth piece to the air purifying chamber, and seats h^3 on the several elements of the air chamber, the sockets h^2, the gaskets h^4 and the clamping mechanism adapted to clamp the sockets against the seats to compress the gaskets, and outlets from the other ends of the respective sections of the air chamber communicating with the inside of the jacket, substantially as described.

7. A watertight submarine jacket comprising a body portion, a non-collapsible helmet secured thereto by a watertight connection, an air purifying chamber containing material capable of absorbing carbon dioxid and liberating oxygen, a mouth piece in the helmet connecting with the purifying chamber, a strainer in the chamber interposed between the inlet and the absorbing material, and an outlet from the purifying chamber in communication with the interior of the jacket, substantially as described.

8. A watertight submarine jacket comprising a body portion, a non-collapsible helmet secured thereto by a watertight connection, an air purifying chamber containing material carrying potassium peroxid and sodium peroxid, substantially in proportions specified, a mouth piece in the helmet communicating with the purifying chamber, and an outlet from the purifying chamber in communication with the interior of the jacket, substantially as described.

In testimony whereof we affix our signatures, in presence of two witnesses.

LAWRENCE YORK SPEAR.
FRANK TAYLOR CABLE.

Witnesses:
H. A. COLES,
WILLIAM H. DAVIS.